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*****
* PROJECT NAME: NIEHS-NICEATM
*
* PROGRAM NAME: UDPsim_RC.sas
*
* DESCRIPTION: Performs the Up and Down Procedure (UDP) simulations;
*
* TYPE      DESCRIPTION
* -----
* INPUT      cytodata_[description].sas --this data set will contain accepted("true") LD50
*           values as well as
*
* OUTPUT     Two Excel tables, one reporting Animal Use information and the other
*           reporting information on stopping rules
*
*****;

options nodate nonumber;

/* COMMENT: Dose Rounding and Cleanup MACROS--the 'next dose' calcuation result in 'messy'
numbers which are either rounded or moved to the appropriate default dose, depending
on the method*/

/*COMMENT: IF the method uses the default dosing scheme with starting dose below the output
from the
regression equation (hereafter referred to as method 1)--these marcoes are used; one to
calculate starting dose, and the other to assign the next dose based on the dose
calculation*/



%macro startdose;
if method='Default' then start=175; else do;
temp=MIN(estLD50,limit);
if temp=limit then start=limit;
if temp<=1.75 then start=1;
if 1.75<temp and temp<=5.5 then start=1.75;
if 5.5<temp and temp<=17.5 then start=5.5;
if 17.5<temp and temp<=55 then start=17.5;
if 55<temp and temp<=175 then start=55;
if 175<temp and temp<=550 then start=175;
if 550<temp and temp<=1750 then start=550;
if 1750<temp and temp<=4000 then start=1750;
if temp>4000 then start=limit; end;
%mend startdose;

%macro doseadjust;
if dose(i)<1 then dose(i)=1;
if 1<dose(i) and dose(i)<4 then dose(i)=1.75;
if 4<dose(i) and dose(i)<7 then dose(i)=5.5;
if 10<dose(i) and dose(i)<20 then dose(i)=17.5;
if 40<dose(i) and dose(i)<60 then dose(i)=55;
if 100<dose(i) and dose(i)<200 then dose(i)=175;
if 500<dose(i) and dose(i)<650 then dose(i)=550;
if dose(i)>1500 and dose(i)<1900 then dose(i)=1750;
if dose(i)>limit-500 then dose(i)=limit;
%mend doseadjust;
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/*COMMENT: IF the method uses the output from the regression equation as the starting
dose(hereafter
refered to as method 2)--this marco is usedto round/assign the next dose based on the dose
calculation*/
%macro doseadjust;
if start=175 then do;
if dose(i)<1 then dose(i)=1;
if 1<dose(i) and dose(i)<4 then dose(i)=1.75;
if 4<dose(i) and dose(i)<7 then dose(i)=5.5;
if 10<dose(i) and dose(i)<20 then dose(i)=17.5;
if 40<dose(i) and dose(i)<60 then dose(i)=55;
if 100<dose(i) and dose(i)<200 then dose(i)=175;
if 500<dose(i) and dose(i)<650 then dose(i)=550;
if dose(i)>1500 and dose(i)<1900 then dose(i)=1750;
if dose(i)>limit-1000 then dose(i)=limit; end;
else do;
dose(i)=round(dose(i),.01);
if dose(i)<1 then dose(i)=1;
if dose(i-1)=limit and rat(i-1)=1 and i>4 then do;
if dose(i-2)<limit then dose(i)=dose(i-2);
else dose(i)=dose(i-3);end;
if dose(i)>limit-1000 then dose(i)=limit;end;
%mend doseadjust;

/*COMMENT: The following marcos perform checks to determine of the stopping rules are
satisfied
stop1=3 consecutive animals dosed at a limit dose with same response
stop2=5 reversals of response in 6 consecutive animals
stop3=likelihood ratio stopping rule satisfied (this is outlined in accompaning
documentation*/
%macro stop1;
if sum(stop1,stop2,stop3)=0 then do;
if sum(rat(i-2),rat(i-1),rat(i))=0 and sum(dose(i-2),dose(i-1),dose(i))=3*limit
then stop1=1;end; else stop1=stop1;

if sum(stop1,stop2,stop3)=0 then do;
if sum(rat(i-2),rat(i-1),rat(i))=3 and sum(dose(i-2),dose(i-1),dose(i))=3
then stop1=1;end; else stop1=stop1;
%mend stop1;

%macro stop2;
if sum(stop1,stop2,stop3)=0 then
do;
if sum(rat(i-5),rat(i-4))=1 and sum(rat(i-4),rat(i-3))=1 and sum(rat(i-3),rat(i-2))=1
and sum(rat(i-2),rat(i-1))=1 and sum(rat(i-1),rat(i))=1 then stop2=1; else stop2=0;
end; else stop2=stop2;
%mend stop2;

%macro stop3;
if sum(nom(i-5),nom(i-4),nom(i-3),nom(i-2),nom(i-1))=5 and sum(stop1,stop2,stop3)=0 then do;
nom6=1;
%do i = 1 %to 15;
    if nom&i.=1 then d&i.=dose&i.; else d&i.=1;
%end;

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est=(d1*d2*d3*d4*d5*d6*d7*d8*d9*d10*d11*d12*d13*d14*d15)

** (1/sum(nom1,nom2,nom3,nom4,nom5,nom6,nom7,nom8,nom9,nom10,nom11,nom12,nom13,nom14,nom15));
lest = est/&ldfac;
uest = est*&ldfac;

%do i = 1 %to 15;
  if in&i.=1 then do;
    pres=probnorm((log10(dose&i.)-log10(est))/asigma);

    if rat&i.=1 then l&i.=pres; else l&i.=1-pres;
    end;

    else l&i.=1;
%end;

lik=l1*l2*l3*l4*l5*l6*l7*l8*l9*l10*l11*l12*l13*l14*l15;

%do i = 1 %to 15;
  if in&i.=1 then do;
    pres=probnorm((log10(dose&i.)-log10(lest))/asigma);

    if rat&i.=1 then l&i.=pres; else l&i.=1-pres; end;
    else l&i.=1;
%end;

llik=l1*l2*l3*l4*l5*l6*l7*l8*l9*l10*l11*l12*l13*l14*l15;

%do i = 1 %to 15;
  if in&i.=1 then do;
    pres=probnorm((log10(dose&i.)-log10(uest))/asigma);

    if rat&i.=1 then l&i.=pres; else l&i.=1-pres; end;
    else l&i.=1;
%end;

ulik=l1*l2*l3*l4*l5*l6*l7*l8*l9*l10*l11*l12*l13*l14*l15;

t1=lik/llik; t2=lik/ulik;
if t1>&critlr and t2>&critlr then stop3=1; else stop3=stop3;

end; else stop3=stop3;

%mend stop3;

/*COMMENT: The following macro uses an 'included' indicator variable to clean out
data/variables
  for animals after a stopping rule is satisfied*/
%macro clean_non_dosed;

%do i = 4 %to 15;
if in&i.=0 then do; rat&i.=.; dose&i.=.; nom&i.=4; pdie&i.=.;
%end;

%mend;

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*****
***** BEGINNING OF PROGRAM *****
***** COMMENT: The following assigns SAS libraries *****
libname udp 'M:\SPHR\NIEHS\EXP Studies\Basic Research\UDP Simulations\Data Sets\New
Regressions';
libname udp2 'M:\SPHR\NIEHS\EXP Studies\Basic Research\UDP Simulations\Data Sets\New
Regressions\by chemical results';

***** COMMENT: The following macro variables specify aspects of the simulation *****
%let trueLD50_sigmas =0.12, 0.25, .5, 1.25, 2; /*List of the true sigmas that will be ran*/
%let asigma=.5; /*Assumed value(s) of sigma*/
%let limit = 5000; /*Upper limit dose, usually 2000 or 5000*/
%let critlr=2.5; /*Critical Value for LR Stopping Rule, usually 2.5*/
%let ldfac=2.5; /*Increase/decrease factor for LR Stopping Rule, usually 2.5*/
%let rep=2000; /*Number of replications at each sigma LD50 combo*/
%let seed=12345; /*Seed for random generator*/

data udp.RC_mech; /*This specifies dataset where results are stored*/
  set udp.cytodata_RC_Mg_mech; /*This specifies input dataset described in header*/
/*COMMENT: the following do loops use the macro variables above to run reps for each
combination
of chosen parameters*/
  do limit = &limit;
  do asigma = &asigma;
  do sigma = &trueLD50_sigmas;
  do rep=1 to &rep;
    estlogic50=log_ic50+dev*rannor(&seed); /*uses lab deviation and ic50 values to
calculate a logged ic50 value*/
/*COMMENT: the following lines of code could change in the following way; if an equation
using Mm is used, the estLD50 calculation will include multiplication by the
molecular weight of the chemical*/
    estic50=10**estlogic50; /*anti-log the estimated value*/
    estlogLD50_conv=2.19448+0.35667*(estlogic50); /*REGRESSION EQUATION GOES
HERE*/
    estLD50=(10**estlogLD50_conv); /*Anti-log LD50 Estimate*/
    mu=log10(ld50_Mg); /*Sets 'true' LD50 from input dataset*/
    do method='Default','Cyto_values'; /*Alternates between old and estimated starting
values*/
  /* NEXT LINE OF CODE DEPENDS ON STARTING DOSE METHOD*/
/*COMMENT: If starting dose is below output from equation (method 1), this line/macro is
used*/
  %startdose;

/*COMMENT: If starting dose is output from equation (method 2), this line is used*/
  if method='Default' then start=175; else start=MIN(estLD50,limit);

/* Creates variables to be assigned to each dosed animal*/
array in(15); array dose(15); array rat(15); array nom(15); array pdie(15);

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/*Stopping Rule 1: If 3 consecutive animals survive at limit dose*/
stop1=0;
/*Stopping Rule 2: If there are 5 reversals in 6 doses*/
stop2=0;
/*Stopping Rule 1: Likelihood Ratio Stopping Rule*/
stop3=0;

/* FIRST DOSING*/
i=1;
in1=1;      /*Indicates animal is included*/
dose1=MAX(start,1); /*Assigns dose based on starting value or lower limit*/
if dose1>limit-1000 then dose1=limit;
pdie(i)=probnorm((log10(dose(1))-mu)/sigma); /*Computes the probability of animal dying*/
/*COMMENT: the following lines adjust the probability due to SAS function limitations*/
if pdie(i)>.99999 then pdie(i)=.99999; else pdie(i)=pdie(i);
if pdie(i)<.00001 then pdie(i)=.00001; else pdie(i)=pdie(i);

rat1=ranbin(&seed,1,pdie(i)); /*This line simulates animal response based on the
probability above*/

/* Many of the parts of the below code are similar to previous dosing, only those added for
each
dosing will be commented on*/

/* SECOND DOSING*/
i=2;
in2=1;
/*COMMENT: the following line assigns the initial dose depending on the first response;
again,
the 'doseadjust' macro adjust/cleans this dose*/
if rat(i-1)=1 then dose(i)=dose(i-1)/10** (asigma); else dose(i)=dose(i-1)*10** (asigma);
%doseadjust

pdie(i)=probnorm((log10(dose(i))-mu)/sigma);
if pdie(i)>.99999 then pdie(i)=.99999; else pdie(i)=pdie(i);
if pdie(i)<.00001 then pdie(i)=.00001; else pdie(i)=pdie(i);

rat2=ranbin(&seed,1,pdie(i));
if rat1+rat2=1 then nom1=1; else nom1=0; /* This line computes the nom(i) variable; an
indicator
for the animal's presence in the nominal
sample size*/

/* THIRD DOSING*/
i=3;
in3=1;
if rat(i-1)=1 then dose(i)=dose(i-1)/10** (asigma); else dose(i)=dose(i-1)*10** (asigma);
%doseadjust
pdie(i)=probnorm((log10(dose(i))-mu)/sigma);
if pdie(i)>.99999 then pdie(i)=.99999; else pdie(i)=pdie(i);
if pdie(i)<.00001 then pdie(i)=.00001; else pdie(i)=pdie(i);
rat3=ranbin(&seed,1,pdie(i));
if sum(rat1,rat2,rat3)=0 or sum(rat1,rat2,rat3)=3 then nom2=0; else nom2=1;
/*COMMENT: Stopping rule macro added as appropriate*/
%stop1

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/* FOURTH DOSING*/
i=4;
if sum(stop1,stop2,stop3)=0 then in4=1; else in4=0;
if rat(i-1)=1 then dose(i)=dose(i-1)/10** (asigma); else dose(i)=dose(i-1)*10** (asigma);
%doseadjust
pdie(i)=probnorm((log10(dose(i))-mu)/sigma);
if pdie(i)>.99999 then pdie(i)=.99999; else pdie(i)=pdie(i);
if pdie(i)<.00001 then pdie(i)=.00001; else pdie(i)=pdie(i);
rat4=ranbin(&seed,1,pdie(i));
if sum(rat1,rat2,rat3,rat4)=0 or sum(rat1,rat2,rat3,rat4)=4 then nom3=0; else nom3=1;
%stop1

/* FIFTH DOSING*/
i=5;
if sum(stop1,stop2,stop3)=0 then in5=1; else in5=0;
if rat(i-1)=1 then dose(i)=dose(i-1)/10** (asigma); else dose(i)=dose(i-1)*10** (asigma);
%doseadjust
pdie(i)=probnorm((log10(dose(i))-mu)/sigma);
if pdie(i)>.99999 then pdie(i)=.99999; else pdie(i)=pdie(i);
if pdie(i)<.00001 then pdie(i)=.00001; else pdie(i)=pdie(i);
rat5=ranbin(&seed,1,pdie(i));
if sum(rat1,rat2,rat3,rat4,rat5)=0 or sum(rat1,rat2,rat3,rat4,rat5)=5
then nom4=0; else nom4=1;
%stop1

/* SIXTH DOSING*/
i=6;
if sum(stop1,stop2,stop3)=0 then in6=1; else in6=0;
if rat(i-1)=1 then dose(i)=dose(i-1)/10** (asigma); else dose(i)=dose(i-1)*10** (asigma);
%doseadjust
pdie(i)=probnorm((log10(dose(i))-mu)/sigma);
if pdie(i)>.99999 then pdie(i)=.99999; else pdie(i)=pdie(i);
if pdie(i)<.00001 then pdie(i)=.00001; else pdie(i)=pdie(i);
rat6=ranbin(&seed,1,pdie(i));
if sum(rat1,rat2,rat3,rat4,rat5,rat6)=0 or sum(rat1,rat2,rat3,rat4,rat5,rat6)=6
then nom5=0; else nom5=1;
/*COMMENT: Stopping rule macro added as appropriate*/
%stop1
%stop2
%stop3

/* 7th DOSING*/
i=7;
if sum(stop1,stop2,stop3)=0 then in7=1; else in7=0;
if rat(i-1)=1 then dose(i)=dose(i-1)/10** (asigma); else dose(i)=dose(i-1)*10** (asigma);
%doseadjust
pdie(i)=probnorm((log10(dose(i))-mu)/sigma);
if pdie(i)>.99999 then pdie(i)=.99999; else pdie(i)=pdie(i);
if pdie(i)<.00001 then pdie(i)=.00001; else pdie(i)=pdie(i);
rat7=ranbin(&seed,1,pdie(i));
if sum(rat1,rat2,rat3,rat4,rat5,rat6,rat7)=0
or sum(rat1,rat2,rat3,rat4,rat5,rat6,rat7)=7
then nom6=0; else nom6=1;
%stop1
%stop2
%stop3

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/* 8th DOSING*/
i=8;
if sum(stop1,stop2,stop3)=0 then in8=1; else in8=0;
if rat(i-1)=1 then dose(i)=dose(i-1)/10** (asigma); else dose(i)=dose(i-1)*10** (asigma);
%doseadjust
pdie(i)=probnorm((log10(dose(i))-mu)/sigma);
if pdie(i)>.99999 then pdie(i)=.99999; else pdie(i)=pdie(i);
if pdie(i)<.00001 then pdie(i)=.00001; else pdie(i)=pdie(i);
rat8=ranbin(&seed,1,pdie(i));
if sum(rat1,rat2,rat3,rat4,rat5,rat6,rat7,rat8)=0
or sum(rat1,rat2,rat3,rat4,rat5,rat6,rat7,rat8)=8
then nom7=0; else nom7=1;
%stop1
%stop2
%stop3

/* 9th DOSING*/
i=9;
if sum(stop1,stop2,stop3)=0 then in9=1; else in9=0;
if rat(i-1)=1 then dose(i)=dose(i-1)/10** (asigma); else dose(i)=dose(i-1)*10** (asigma);
%doseadjust
pdie(i)=probnorm((log10(dose(i))-mu)/sigma);
if pdie(i)>.99999 then pdie(i)=.99999; else pdie(i)=pdie(i);
if pdie(i)<.00001 then pdie(i)=.00001; else pdie(i)=pdie(i);
rat9=ranbin(&seed,1,pdie(i));
if sum(rat1,rat2,rat3,rat4,rat5,rat6,rat7,rat8,rat9)=0
or sum(rat1,rat2,rat3,rat4,rat5,rat6,rat7,rat8,rat9)=9
then nom8=0; else nom8=1;
%stop1
%stop2
%stop3

/* 10th DOSING*/
i=10;
if sum(stop1,stop2,stop3)=0 then in10=1; else in10=0;
if rat(i-1)=1 then dose(i)=dose(i-1)/10** (asigma); else dose(i)=dose(i-1)*10** (asigma);
%doseadjust
pdie(i)=probnorm((log10(dose(i))-mu)/sigma);
if pdie(i)>.99999 then pdie(i)=.99999; else pdie(i)=pdie(i);
if pdie(i)<.00001 then pdie(i)=.00001; else pdie(i)=pdie(i);
rat10=ranbin(&seed,1,pdie(i));
if sum(rat1,rat2,rat3,rat4,rat5,rat6,rat7,rat8,rat9,rat10)=0
or sum(rat1,rat2,rat3,rat4,rat5,rat6,rat7,rat8,rat9,rat10)=10
then nom9=0; else nom9=1;
%stop1
%stop2
%stop3

/* 11th DOSING*/
i=11;
if sum(stop1,stop2,stop3)=0 then in11=1; else in11=0;
if rat(i-1)=1 then dose(i)=dose(i-1)/10** (asigma); else dose(i)=dose(i-1)*10** (asigma);
%doseadjust
pdie(i)=probnorm((log10(dose(i))-mu)/sigma);
if pdie(i)>.99999 then pdie(i)=.99999; else pdie(i)=pdie(i);
if pdie(i)<.00001 then pdie(i)=.00001; else pdie(i)=pdie(i);
rat11=ranbin(&seed,1,pdie(i));

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if sum(rat1,rat2,rat3,rat4,rat5,rat6,rat7,rat8,rat9,rat10,rat11)=0
or sum(rat1,rat2,rat3,rat4,rat5,rat6,rat7,rat8,rat9,rat10,rat11)=11
then nom10=0; else nom10=1;
%stop1
%stop2
%stop3

/* 12th DOSING*/
i=12;
if sum(stop1,stop2,stop3)=0 then in12=1; else in12=0;
if rat(i-1)=1 then dose(i)=dose(i-1)/10** (asigma); else dose(i)=dose(i-1)*10** (asigma);
%doseadjust
pdie(i)=probnorm((log10(dose(i))-mu)/sigma);
if pdie(i)>.99999 then pdie(i)=.99999; else pdie(i)=pdie(i);
if pdie(i)<.00001 then pdie(i)=.00001; else pdie(i)=pdie(i);
rat12=ranbin(&seed,1,pdie(i));
if sum(rat1,rat2,rat3,rat4,rat5,rat6,rat7,rat8,rat9,rat10,rat11,rat12)=0
or sum(rat1,rat2,rat3,rat4,rat5,rat6,rat7,rat8,rat9,rat10,rat11,rat12)=12
then nom11=0; else nom11=1;
%stop1
%stop2
%stop3

/* 13th DOSING*/
i=13;
if sum(stop1,stop2,stop3)=0 then in13=1; else in13=0;
if rat(i-1)=1 then dose(i)=dose(i-1)/10** (asigma); else dose(i)=dose(i-1)*10** (asigma);
%doseadjust
pdie(i)=probnorm((log10(dose(i))-mu)/sigma);
if pdie(i)>.99999 then pdie(i)=.99999; else pdie(i)=pdie(i);
if pdie(i)<.00001 then pdie(i)=.00001; else pdie(i)=pdie(i);
rat13=ranbin(&seed,1,pdie(i));
if sum(rat1,rat2,rat3,rat4,rat5,rat6,rat7,rat8,rat9,rat10,rat11,rat12,rat13)=0
or sum(rat1,rat2,rat3,rat4,rat5,rat6,rat7,rat8,rat9,rat10,rat11,rat12,rat13)=13
then nom12=0; else nom12=1;
%stop1
%stop2
%stop3

/* 14th DOSING*/
i=14;
if sum(stop1,stop2,stop3)=0 then in14=1; else in14=0;
if rat(i-1)=1 then dose(i)=dose(i-1)/10** (asigma); else dose(i)=dose(i-1)*10** (asigma);
%doseadjust
pdie(i)=probnorm((log10(dose(i))-mu)/sigma);
if pdie(i)>.99999 then pdie(i)=.99999; else pdie(i)=pdie(i);
if pdie(i)<.00001 then pdie(i)=.00001; else pdie(i)=pdie(i);
rat14=ranbin(&seed,1,pdie(i));
if sum(rat1,rat2,rat3,rat4,rat5,rat6,rat7,rat8,rat9,rat10,rat11,rat12,rat13,rat14)=0
or sum(rat1,rat2,rat3,rat4,rat5,rat6,rat7,rat8,rat9,rat10,rat11,rat12,rat13,rat14)=14
then nom13=0; else nom13=1;
%stop1
%stop2
%stop3

/* 15th DOSING*/
i=15;

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if sum(stop1,stop2,stop3)=0 then in15=1; else in15=0;
if rat(i-1)=1 then dose(i)=dose(i-1)/10** (asigma); else dose(i)=dose(i-1)*10** (asigma);
%doseadjust
pdie(i)=probnorm((log10(dose(i))-mu)/sigma);
if pdie(i)>.99999 then pdie(i)=.99999; else pdie(i)=pdie(i);
if pdie(i)<.00001 then pdie(i)=.00001; else pdie(i)=pdie(i);
rat15=ranbin(&seed,1,pdie(i));
if sum(rat1,rat2,rat3,rat4,rat5,rat6,rat7,rat8,rat9,rat10,rat11,rat12,rat13,rat14,rat15)=0
or sum(rat1,rat2,rat3,rat4,rat5,rat6,rat7,rat8,rat9,rat10,rat11,rat12,rat13,rat14,rat15)=15
then nom14=0; else nom14=1;
if in15=1 then stop4=1; else stop4=0;
/*No stopping rules as 15 is the max number of animals allowed*/

/*Clean Up non-dosed cases*/
%clean_non_dosed;

/*Define Variable for Number of animals used*/
animals=sum(in1,in2,in3,in4,in5,in6,in7,in8,in9,in10,in11,in12,in13,in14,in15);

/*define Number of animals that died/lived*/
died=sum(rat1,rat2,rat3,rat4,rat5,rat6,rat7,rat8,rat9,rat10,rat11,rat12,rat13,rat14,rat15);
lived=animals-died;

output;end;end;end;end;end;
run;

/* HERE DOWN SUMMARIZES AND EXPORTS RESULTS INTO EXCEL TABLES*/

ods output Summary=results;
ods trace on;
ods listing close;

proc means mean std stderr data=udp.RC_mech; /*add the stderr*/
  class chemical cell sigma method ld50_Mm ld50_Mg ic50;
  var estLD50 estic50 rat1 stop1 stop2 stop3 stop4 died lived animals;
run;

data udp2.RC_mech_results; set results;
  if method='Cyto_va' then method='Cyto'; LD50_estimate=estLD50_Mean;
  LD50_StdDev=estLD50_StdDev; IC50_estimate=estic50_Mean; IC50_StdDev=estic50_StdDev;
  rat1_die=rat1_Mean; Stop1=stop1_Mean; Stop2=stop2_Mean; Stop3=stop3_Mean;
  Stop4=stop4_Mean;
  Animals=animals_Mean; Animals_StdDev=animals_StdDev; Animals_StdErr=animals_StdErr;
  died=died_Mean; lived=lived_Mean;
  keep chemical cell sigma method ld50_Mm ld50_Mg ic50 LD50_estimate LD50_StdDev
  IC50_estimate
  IC50_StdDev Animals_StdDev Animals_StdErr rat1_die Stop1 Stop2 Stop3 Stop4 Animals
  lived died;
run;
ods listing;

data out1;
  set udp2.RC_mech_results;
  keep chemical cell sigma method stop1 stop2 stop3 stop4 lived died animals;
run;
proc export data=out1

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dbms=excel
outfile='M:\SPHR\NIEHS\EXP Studies\Basic Research\Niceatm\UDP Simulation
results\Results\RC_mech_Stopping_Summary_mgkg.xls';
sheet=RC;
run;

data out1;
  set udp2.RC_mech_results;
  keep chemical cell sigma method ld50_Mm ld50_Mg LD50_estimate IC50_estimate
Animals_StdErr Animals;
run;
proc export data=out1
dbms=excel
  outfile='M:\SPHR\NIEHS\EXP Studies\Basic Research\Niceatm\UDP Simulation
results\Results\RC_mech_Animal_Savings_mgkg.xls';
  sheet=RC;
run;
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